

# **'To Boldly Go' Building a Virtual Classroom**

**by**

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# 'To Boldly Go ...' Building A Virtual Classroom

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**Abstract.** Many things are said on where Tomorrow's Technology could take education. There is only one way to know: Doing it. The concept of an *Exploration-Based Learning Environment* has recently been introduced into the argument that technology can put students back into the field or real learning. IPN has set foot there, where no school has gone before, by actually building a Virtual Classroom. This paper is about our first step towards the Virtual Classroom: Experience-Based Learning by simulations. A field study on the processes involved when going from a regular educational setting to using simulations as part of the educational setting was done. We discuss eventual pitfalls and the role changes in education for both teacher and pupil, the importance of understanding the psychological process that the pupil goes through and the consequences this has for the guiding staff. Changes are not only necessary to keep up with the change but also to break through the vicious circle of what we call the trend of "Spectacle and Boredom" in education.

## 1 INTRODUCTION

In a time of technological and social change in 2004 IPN got excited about the idea of building a **Virtual Classroom**. Challenged by the impressive waste land that lay in front of us we got triggered to enter that frontier. To make way. Not only driven by curiosity about the future and the unknown, but also by the notion that it could shed a new light on the current issues and challenges facing education. Many comments are heard on modern education and its future. What we hear mostly, though, are today's and yesterday's voices. For Tomorrow to be heard, it first must be given a voice. With taking on the challenge of building a Virtual Classroom we stated that the future of education appears to lie in the basic idea of Exploration Based Learning.

With that we take it as our job to get to the bottom of that idea: Learning as an adventure, wrapped in models of simple to complex learning objectives to simulations that lead the student into his process of development through exploring the cause and effect relationships of their universal interactions. The goal is to provide a map for a route that brings along experiences you normally do not get until you are on the job. Hence, there is a fertile marriage between knowledge, technology and experience, leading to insight and in the end to a vision of the job before you get on the job. This is an idea portrayed by Darby [1] in his ground-breaking work on the *Technologically Enhanced Classroom of Tomorrow*. In his ideas we found a perfectly challenging theoretical framework. That way an ambition was born, and in 2005 it became reality. In August of that year we made the first step towards the Virtual Classroom by using models and simulations as a part of experience-based learning and with that an extensive field study, the first of its kind, commenced.

## 2 BUILDING THE VIRTUAL CLASSROOM

When we took on the challenge of building a Virtual Classroom we took it on with one major question in our minds: How will the pupils, teachers and team respond in this new setting?

When introducing simulations and Exploration-Based Learning we considered it important to make sure that the process of learning was still taken seriously. We wanted to prevent what we call "infotainment": using simulations and technology to amaze, motivate and entertain children. We wanted to guard the old concept of triggering or confusing by knowledge. Especially because of our technological ambition we wanted to prevent it from becoming no more than a thrill as thrills die after a while. You get used to them. A very tricky trap in technological development: Spectacle without a cause, making the initial goal of education look blurry. Therefore it was decided in an early stage that the educational setting we were building was not to motivate the pupils but to educate them and that technology was only used as an addition proven to be useful to their curriculum.

The goal of Exploration-Based Learning is to turn learning into an adventure underpinned by the power of simulation – learning from the real world – that leads the students into their individual cognitive process of development, both scientific and personal. This means that the student plays a central role [2],[3]. He must learn to take responsibility for his learning process.

In setting up the basics and establishing the requirements for the virtual classroom we started with a set of fundamental constraints:

- Education goals should be at least as high as in current educational settings and the whole process should meet the requirements of good education [1],[4],[5],[6]

- Goals should be clear and specific.[6]
- The educational setting is not to motivate but to educate. This goes for the use of technology as well as any simulation the student takes part in.
- The Virtual Classroom should eventually be suitable for students of all ages and therefore we must from the start include pupils of all ages between 8 and 18 [6].

In the first stage of building the Virtual Classroom we decided in what sequence it would be built.

Since our primary goal was to find out how students and staff would respond we chose to start with a modest technology approach compared to our ambition. We first wanted to see what the effect would be of models and simulations and of the new education setting of Exploration-Based Learning. Therefore we came to the following sequence of building:

1. Exploration-Based Learning by Simulations
2. Technologically Enhanced Classroom
3. Virtual Classroom

We have finished the first phase of development and will discuss some of the results here.

## **2.1 The start of phase one: exploration based learning**

The principal idea of the first phase is building an educational setting where the student not only acquires a diploma but also builds an individual theoretical and practical portfolio on his fields of interests helped by simulations [1]. Translating this idea into reality resulted in the following schedule: In the morning a group of pupils from 8 to 17 worked on their knowledge goals, supported by teachers, professionals, coaches, individual computer stations, a laboratory, a workshop for arts and crafts and any educational method available accompanied by a lists of specific knowledge goals. In the afternoon they work on a subject of personal choice, chosen within a theme set by the school. Together these tracks are built around a simulation project that has to be completed within 6 to 10 weeks depending on the students working level. Terms for both tracks are given in advance. A project is successfully completed when all terms are met and fused into a presentation with audience. They also have to hand in a file with all the assignments and all tests (tests have to be completed with a score of 70% or higher). (In the Netherlands normally 60% is sufficient in regular education)

Since interests of students can vary we were confronted with the practical problem that not any required simulation could be provided in advance. Practical and also financial problems got in the way. So we decided that more complicated or expensive simulations were on demand if sufficiently motivated by the student. In that

process technology is of course a key factor. Yet for economical reasons we indeed decided to start off with modest technology.

## **2.2 The daily reality of Exploration Based Learning**

We started of with a very enthusiastic group of pupils but there is an old saying--"be careful what you wish for"--that soon caught up with us. Because exploring is adventurous and adventure is exciting, sometimes a bit too exciting, pupils were confronted with their own ambitions and personal goals in a way they had not been before. This led to a very confronting route that needed specific guidance, for it involves a complete change of role of the student and of the teacher. And showed us that possibly a new role has to be introduced all together one that might be called 'activation mentor.'

After two years we can now say that all children who are introduced to Exploration-Based Learning go through a number of steps that can be summarized in four major phases.

- In the first phase they try to hold on to the familiar way while being stimulated by what is possible.
- The second phase starts with the realization that in Exploration-Based Learning it is important to know about yourself, mainly your way of gathering and processing information.
- During the third phase the students reacted with a new kind of behavior we had to classify with a Dutch word we cannot easily translate: 'Lieren', which means to run around in circles on purpose, without going anywhere and with the sole goal of avoiding a process. This was compensated by the almost complete disappearance of any kind of behavior in which authority is challenged. We call the third phase the "lierphase".
- In phase four the pupil activates himself and is very committed to his work and exploration of all education has to offer.

We found the first phase to be very difficult. It seems many children are taught at an early age that an experimental approach or the exploring idea is 'not done.' Children come up with very "safe" project ideas at first, testing in many ways the mental flexibility of the staff. When disappointed they became very difficult to activate again and the process had to be started all over. Their ideas are a very personal thing and bringing them out is a process of careful psychology, something we found teachers not qualified for.

Phase three however is the hardest phase to guide pupils through. It is a very confronting stage in which guidance is very important. It is in a way the process of the first stage but at a deeper level. In fact the process is so completely different from any relative process in regular education, that

teachers needed serious coaching and psychological courses to learn how to deal with it and still could not manage beyond the borders of their primary function: teaching about a specific subject. We found approximately one out of 15 teachers capable of being meaningful in that stage of the process and could, with proper training, possibly grow into the new task that lies ahead. We however had to use staff with a completely different background than education to make the process of the children go well. Hence, this experience concluded that future teachers have to make a choice whether they want to guide the pupil with what we call "process-psychology" or if teachers want to be a source of information that the child depends on together with other professionals. Since guiding the process is a completely different task in the new setting, it is maybe more likely that a specially educated part of the staff will take on this responsibility.

The teachers who stayed closer to being a source of information had to change their role considerably as well. In the setting of exploration-based learning by simulations we found that the pupils had little need for a traditional teacher. The questions they had were much more in the line of how to learn, what techniques to use, how to be as effective as possible, how to plan etc. In short our result was in line with what is shown by current research into learning.

Professionals can be very useful as part of specific simulations/projects but we found that most of the time they have no interest in educational route or the process behind it that the child goes through. But with more importance placed on the role of professionals working with what might be their future employees, that problem may be resolved. However since the process the child goes through can be very intense and complex and they have no psychological background it is doubtful if they will be able to play an important role in the process behind the educational route.

The All Round teacher and the Redeeming Professional therefore could be seen as unsustainable ideals. Qualified teachers are necessary, yes, certainly as an expert on the process of learning. Professionals indeed might know a lot, but often they have no idea of students and often also have no interest in them. They can be useful but only as part of a team capable of guiding the process. A team, we found, had to have much more knowledge of psychology than before.

### 3 Results of Exploration-Based Learning

Looking back on two years of Exploration-Based Learning we can say that it is successful. 94% of the results are significantly better than in regular groups. The pupils are enthusiastic, and even when they are not, none of them want to go back to the old educational environment. They do not experience school as boring or useless anymore;

they have the feeling that they learn things and that they know more than other children and have a broader view on the world. Most of them have also made a major leap in presenting themselves and their ambitions to the world, and they feel more secure about their interests and about who they are. There is, of course, a catch.

The process the child goes through in the beginning requires a significant amount of guidance. Not only is exploration an exciting concept, but also a confusing and confronting process that pupils are not familiar with. Also not every child is free of personal background that can be a serious blockage in the learning process. Currently, teachers are not capable of giving that guidance since the process of the child is very confronting and personal, and teachers, as trained today, have no experience with this kind of student teacher dynamic.

Exploration-Based Simulations has to be introduced in steps. Like a zoo-born mammal is put back in to nature by enlarging the cage the same goes for Exploration-Based Learning. A child is set into motion because it sees the possibility to work on certain interests. That is very tempting but also very threatening. All of a sudden you are plunged into something you really like. Not just for fun but for the long run. That can be a very stressful situation. Of course there is nothing wrong with stimulation but it should be possible to adjust to the individual tempo. This means that a very well structured organization is required to focus on the process of the individual child.

### 4 CONCLUSION

In building the Virtual Classroom we found that Tomorrow, Today and Yesterday have much more in common than we initially thought. Indeed The Future has already begun. In Today's story we found the answer to many of Tomorrow's obstacles. Exploration is meant to be an adventure and it should be presented like one, in steps, and then it is an agreed journey between the mentor and the pupil on what steps to take next without letting go of the specific goals of the adventure. In that process the general perspective on education must be refreshed. Education is not something that has to be sold to the pupil. It is about the students' future and, to a larger extent, their own responsibility. Therefore, education is about putting the responsibility where it belongs. In a Virtual Classroom the students have to be more responsible. Teachers face a major role change in that they too will have to review their own responsibilities.

In mapping that process two myths were revealed. There is no *All Round Teacher* that knows it all, and there is no utopian *Redeeming Professional* that will make it all happen. Teachers know about the process of learning and professionals know about their job. Each can fulfill a unique role in the developmental process of a student but they

should not be bothered with a role that does not suit them.

In practice, however, we found a threefold division in the professionals that should support students in their exploration based educational path towards learning:

1. The teacher, in the role of the knowledge specialist, knows about the subject and communicating knowledge.
2. The professional, in the role of the field specialist, supports the knowledge specialist by supplementing the informational menu with experience and reality.
3. What we call "the activation mentor" that is able to support the process of self activation. We found that without this specific role pupils get stuck.

In mapping the process of self activation and its influence on a child's learning process and the teacher's ever changing role, every day more requirements are discovered. More and more of the waste land become mapped. Within two years we managed to overcome the obstacles that the introduction of Exploration-Based Learning brought us. We are ready now to take the next step--To embrace Tomorrow's Technology--so are the pupils. So far, the most important conclusion might be that technology must be trained for. It brings possibilities that not every student can handle. It causes very confronting processes that need adequate guidance resulting in a different role for both teacher and student. Furthermore, and most importantly, it seems training for technology demands a close relationship between education and psychology for the education process to be successful.

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# Whose Curriculum Is This?

Chemistry

Magnetism & Electromagnetic Field

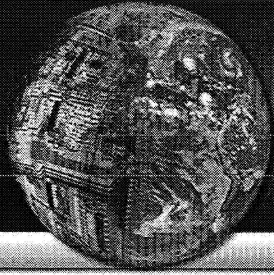
Genetics

Giving a master class on light for peers

Cern & Teleportation

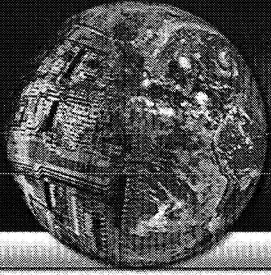
Concluding the project 'Chemicals and Safety'  
with a 30-minute, self-written play on Nobel  
through the eyes of his housemaid





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# Building Tomorrow's Classroom



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# Exploration-Based Learning:

## Seeking The Adventure In Education



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# What Happens?

**The Student becomes an Adventurer.**





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## **Consequence**

A process of Role Changing based on Student responsibility. The Student will be trained to become a Knowledge Manager.



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## **Mountain Climbing**

There is a mountain that has to be climbed, and we can not climb it for you.

**We can only climb with you, being the experienced climbers that we are.**



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## How?

Full 1 on 1 tutoring and mentoring

Lack of means

Different kind of goal setting

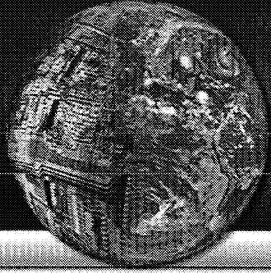
A completely new organisational structure  
that enables an on demand setting



# Building Process

- Step 1: Building the organisational structure to support individual on demand learning
- Step2: Processing the data on the student's process and the way it relates to the change in staff behaviour and management settings
- Step 3: Preparing the actual building of the classroom





## Getting Ready

Clear view on the processes involved with Student responsibility

Clear view on the influence of the current basic technology we are using in our curriculae

Well functioning Organisation

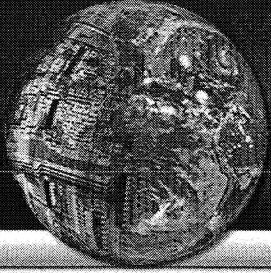
Students that want to move on

Knowing what we need from technology



# Current Use of Technology

- Subject Data / Internet
  - Data training
- Basic Student Administration
- Self Designed Monitoring Software
- Computer supported laboratory
  - 1 Pc for each child
- Graphic Working station
  - Multi Media Room
- Audio video based designed assignments



# What We Need from Technology

- ◆ Direct Processing of Observed data
  - ◆ An Allround Evaluative system
  - ◆ Interactive learning materials
- ◆ Age appropriate display (animations etc)
  - ◆ Virtual simulations
- ◆ Virtual Mentoring & Tutoring Intelligence
  - ◆ Quality Control
- ◆ Facilitation of individual and Team projects
  - ◆ Embedded Assessment



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## **Student's Condition**

**Stabilizing the organisation and methodising makes it so that we are now able to provide to a broader student population.**

**Students actually like going to school, and they often have to be reminded of the phenomenon called a break.**

**They learn more information, more easily and especially more efficiently.**

**They all indicate that they learn more and that they know more and are more solution-focused than other children. Plus they indicate to like that.**





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Education is an adventure that  
actually makes children  
smarter.

***Thank you!***



### **III. Curriculum Development Session**

#### **Integrating Modeling, Simulation, and Game-Based Learning into Science, Technology, Engineering, and Mathematics**